1. (Original) A method of at least detecting defects, if any, of at least one rotor (6, 10) of a rotary wing aircraft (1) of a particular type of rotary wing aircraft, a defect corresponding to a defective state of a part of the rotor (6, 10),

characterized in that:

I - in a preliminary step, in which a reference aircraft is used corresponding to a rotary wing aircraft (1) of said particular type, having its rotor (6, 10) without defect and adjusted to a reference setting for which the vibration level of at least one portion (3, 8) of said aircraft (1) is at a minimum, the following operations are performed:

a) taking at least a first series of measurements on said reference aircraft (1), by measuring, during particular operation of said reference aircraft, the values of at least two accelerations which are measured at arbitrary locations of said portion (3, 8) of the reference aircraft and which are representative of the vibration generated at said portion (3, 8) of the reference aircraft:

α) firstly using the rotor (6, 10) of the reference aircraft (1) which is without defect and which is adjusted on said reference setting; and

β) secondly by introducing defects into said rotor (6, 10); and

b) on the basis of said first series of acceleration measurements and assuming that the aircraft (1) is a deformable body, determining a neural network that illustrates the relationships between said accelerations and at least said defects; and

II - in a later step, for at least defecting any defects of the rotor (6, 10) of a particular rotary wing aircraft (1) of said aircraft type, the following operations are performed:

a) taking a second series of measurements are taken on said particular aircraft (1) by

measuring the values of at least some of said accelerations at said portion (3, 8) of the aircraft during particular operation of said aircraft; and

b) on the basis of said second series of acceleration measurements and on the basis of the neural network determined in step I/b), detecting any defects of said rotor (6, 8).

2. (Original) A method according to claim 1, for also adjusting at least one rotor (6, 10) of a rotary wing aircraft (1) of said particular type of rotary wing aircraft,

characterized in that:

I - in the preliminary step, the following operations are performed:

a) taking said first series of measurements on said reference aircraft (1) in a situation γ in addition to said situations α) and β), by measuring, during the particular operation of said reference aircraft, the values of said accelerations which are representative of vibration generated at said portion (3, 8) of the reference aircraft, and varying the adjustment values of a plurality of adjustment parameters of said rotor (6, 10) in said situation γ); and

b) on the basis of said first series of acceleration measurements, determining said neural network which illustrates the relationships between firstly said accelerations and secondly said defects and said adjustment parameters; and

II - in the later step, which is additionally for adjusting the rotor (6, 10) of the particular rotary wing aircraft (1) of said type of aircraft, after said operations a) and b), the following operations are performed:

c) on the basis of said second series of acceleration measurements and of the neural network determined in step I/b), determining the adjustment values of at least some of said adjustment parameters which enable the level of vibration of said portion (3, 8) of the aircraft

(1) to be minimized; and

d) applying to the rotor (6, 10) of said aircraft (1) the adjustment values as determined in this way for said adjustment parameters.

3. (Original) A method according to claim 2, characterized, between steps II/b) and II/c), by eliminating any defects that have been detected in said step II/b), and by taking a new, second series of measurements for use in step II/c) for determining the adjustment parameters.

4. (Currently Amended) A method according to claim 2~~ or claim 3~~, characterized in that the adjustment elements defining said adjustment parameters comprise at least the following elements (25, 27, 28) of the rotor (6) of the aircraft:

• at least one balance weight (25) for each of the blades (7) of the rotor (6);

• a pitch-link (27) on each of the blades (7) of the rotor (6), except for one blade which represents a reference blade; and

• at least one compensating tab (28) on the trailing edge (29) of each of the blades (7) of the rotor (6).

5. (Currently Amended) A method according to ~~any preceding~~ claim 2, characterized in that for an advance and lift rotor (6) of a rotary wing aircraft (1), in said step I/a), said first series of measurements are taken during at least one of the following test flights:

• a reference flight with the rotor (6) adjusted in accordance with said reference setting;

• flights with defects of the rotor (6);

• a flight with a particular mis-adjustment of at least one balance weight (25) of a blade (7);

• a flight with a particular mis-adjustment of at least one pitch-link (27) of a blade (7); and

• a flight with a particular mis-adjustment of at least one compensating tab (28) provided on the trailing edge (29) of a blade (7).

6. (Original) A method according to claim 5, characterized in that at least one of said test flights during step I/a) and of said measurement flights during step II/a) includes the following configurations, during which measurements are taken:

• a stationary flight configuration;

• a configuration of flight at about 50 m/s;

• a configuration of flight at continuous maximum power; and

• a test on the ground with the rotor (6) revolving.

7. (Currently Amended) A method according to ~~any preceding~~ claim 1, characterized in that for an advance and lift rotor (6) of a rotary wing aircraft (1), said portion of the aircraft where the values of said accelerations are measured is the cabin (3) of the aircraft (1).

8. (Currently Amended) A method according to ~~any one of~~ claim[s] 1 ~~to 4~~, characterized in that for an anti-torque tail rotor (10) of a rotary wing aircraft (1), said portion of the aircraft at which the values of said accelerations are measured is the tail boom (8) of the aircraft (1).

9. (Currently Amended) A method according to ~~any one of~~ claim[s] 1 ~~to 4~~, characterized in that for an anti-torque tail rotor (10) of a rotary wing aircraft (1), at least one of said first and second series of measurements is taken with the aircraft (1) on the ground and

the tail rotor (10) in operation.

10. (Currently Amended) A method according to ~~any one of~~ claim[s] 2 ~~to 4~~, characterized in that during step I/b), account is taken of the following additional assumptions for determining said neural network:

• the rotor (6, 10) is not isotropic;

• the relationships between firstly the defects and the adjustment parameters and secondly the acceleration values are non-linear; and

• the vibration level existing at any particular point of the aircraft (1) corresponds to the sum of the elementary vibrations generated at said particular point and caused by the defects and the mis-adjustment of said adjustment parameters.

11. (Currently Amended) A method according to ~~any preceding~~ claim 1, characterized in that during step II/b), the defects that are detected are displayed.

12. (Currently Amended) A method according to ~~any preceding~~ claim 1, characterized in that during step II/b), the defects that are detected are recorded.

13. (Currently Amended) A method according to ~~any one of~~ claim[s] 2 ~~to 4~~, characterized in that during step II/c), the adjustment value α of an adjustment parameter is determined by minimizing the following expression:

$$\| R(\alpha) + \gamma \|^2$$

in which:

• R is the corresponding transfer function of said ~~measurement~~ neural network; and

• γ is a vector containing the vibration level representative of the measurements taken

in step II/a).

14. (Currently Amended) A method according to ~~any one of~~ claim[s] 2 ~~to 4~~, characterized in that during step II/c), the adjustment values that have been determined are displayed.

15. (Currently Amended) A method according to ~~any one of~~ claim[s] 2 ~~to 4~~, characterized in that during step II/c), the adjustment values that have been determined are recorded.

16. (Currently Amended) A method according to ~~any one of~~ claim[s] 2 ~~to 4~~, characterized in that a resetting stage is performed during which the following operations are performed:

a) taking a third series of measurements while causing the adjustment values of only some of said adjustment parameters to vary; and

b) adjusting said neural network on the basis of said third series of measurements, for the corresponding relationships which relate to the adjustment parameters for which the adjustment values have been varied.

17. (Original) Apparatus for detecting defects and for determining adjustment values for adjustment parameters of a rotor (6, 10) of a rotary wing aircraft (1), characterized in that it comprises:

• a calculator (15) suitable for automatically determining said defects and said adjustment values on the basis of a neural network and on the basis of measurement values of a second series of measurements;

• interface means (17) between said apparatus (16) and an operator, enabling the

operator to input said measurement values of said second series of measurements into said calculator (15); and

• indicator means (19) for informing said operator of the defects and the adjustment values determined by said calculator (15).

18. (Original) Apparatus according to claim 17, characterized in that said calculator (15) is suitable for determining said neural network on the basis of measurement values of a first series of measurements, and in that said interface means (17) further enables said operator to input into said calculator (15) said measurement values of said first series of measurements.

19. (Currently Amended) Apparatus according to claim 17 ~~or claim 18~~, characterized in that it further includes a memory (30) for storing said neural network.